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Description

This invention relates to a ball valve, and more particularly, to a ball valve comprising a valve body, a ball set in the valve body and a seat carrier located on at least one side of the ball, in the valve body, to carry a seat to hold the ball in position within the valve body. The seat carrier is detachably fixed in the valve body.

Ball valves are already known in the prior art. The known ball valves comprise of valve body, a stem, a ball, seats, a pair of seat carriers, connecting sleeves and union nuts. The valve body has a cylindrical hole extending therethrough which forms the valve chamber. The stem extends laterally into the central portion of the valve body, with one end thereof projecting into the valve chamber. The ball has a bore diametrically extending therethrough and is inserted in the valve chamber and engages the end of the stem such that it is rotatably held in the valve chamber. The ball must be able to be inserted into the valve body for assembling, and for this purpose the ball has a groove on the top thereof to receive and engage the end of the stem. Thus, the ball can be removed from the valve body when the ball is turned sideways, that is, in the state when the bore crosses the valve chamber in the valve body i.e., in the closed position.

A seat carrier is located on at least one side of the ball and, usually two seat carriers are located one on each side of the ball. The seat carrier is provided with a ball seat on the end facing to the ball in close contact with the ball to set the ball in position and to allow the ball to rotate freely. If the ball seat is abraded by the rotation of the ball, after a period of use and a gap may be formed between the ball seat and the ball. The seat carrier is designed to be able to move towards the ball in the valve body to eliminate the gap. Thus, most of the conventional ball valves have not been designed to firmly secure the seat carrier to the valve body.

In order to prevent the seat carrier from moving out of the valve body, a connecting sleeve is provided in contact with the seat carrier and joined to the valve body by a union nut. Thus the ball seat is pressed against the ball via the seat carrier and the connecting sleeve by the force exerted by the union nut and this prevents the ball from coming out of the valve body. Therefore, if the ball seat is worn it gives rise to play between the ball and the seat, and then the union nut must be further rotated to advance the connecting sleeve inwardly to bring the ball seat into close contact with the ball.

The above described ball valve, however, has serious drawbacks in that the union nut joined on the downstream of the valve cannot be removed from the valve body while fluid pressure is being maintained. More particularly, it is sometimes required that a pipe connected on the downstream of the valve be replaced or repaired while the valve is in use. In such cases, the valve is closed and the union nut on the downstream is removed, the ball however, comes out of the valve body together

with the seat carrier because of the fluid pressure in the line, and hence it may result in human body injury or a great deal of fluid flowing out of the line. These drawbacks result from the necessity that the seat carrier must be movable in the valve body in the axial direction thereof and that the ball, when turned sideways, i.e., in the closed position, must be detachable from the stem in order that the valve can be assembled.

In order to overcome the above drawbacks, United States Patent No. 4,059,250 (& DE-A-2552297) suggests that the seat carrier be directly fixed to the valve body. This is accomplished using a bayonet means, wherein, the seat carriers are provided with partial projections on the outer surface thereof, and the valve body, at each end thereof, is provided with recesses and grooves on the inner wall surface thereof. The projections are inserted into the recesses and then set in the grooves. More particularly, the seat carriers are provided with the projections, that is dogs, on the outer surface at one end thereof and, the valve body is cut-away from both ends towards the inner portion thereof to form recesses and grooves on the inner wall surface thereof and to form lips on the remaining surface. The projections are mated with the recesses, and the seat carriers are inserted into the valve body and then rotated to fit the projections in the grooves, Thus by engaging the projections with the lips, the seat carriers are fixed to the valve body.

Using the bayonet means, the seat carriers are fixed to the valve body immediately after having been inserted and rotated. However, sometimes the seat carriers are rotated back and as a result, the seat carrier may come out of the valve body. Thus, United States Patent No. 4,059,250 suggests that a wedge be inserted between the seat carrier and the valve body to prevent the seat carrier from rotating back in the valve body.

The formation of the grooves in the valve body, as suggested by the United States Patent No. 4,059,250, however, has the disadvantage that the thickness of the valve body is partially reduced and this results in a decrease in strength or pressure resistance. Thus, in order to maintain the original pressure resistance, the thickness of the entire valve body must be increased, which results in the disadvantage that the valve, as a whole, increases in weight and further, the cost of manufacturing is increased. In spite of the apparent disadvantages, United States Patent No. 4,059,250 suggests the formation of the grooves in the valve body, and this is due to the thought that there is no other way for fixing the seat carrier to the valve body. In other words, the prior art patent is based on the idea that, if projections are provided on the inner surface of the valve body, the projections would hinder insertion of the ball when the valve is to be assembled, and that the grooves should be formed on the valve body in order to avoid the hindrance to the insertion. The present invention aims to overcome this problem in the prior art.

Further, in United States Patent No. 4,059,250, the insertion of the wedge between the seat carrier

and the valve body also has disadvantages. In particular, the wedge is small and may be lost when the valve is disassembled or forgotten when the valve is assembled. When the used valve is to be repaired, most workers who assemble the valve do not know particular structures of the valve and they are liable to fail to insert the wedge in the valve. Furthermore, the wedge is very small and thus it is difficult to insert. If the wedge is not inserted, the seat carrier may rotate backwards when the union nut is removed, and the seat carrier may come out of the valve body and simultaneously the ball may come out. The present invention eliminates these disadvantages.

US-A-4458878 shows a valve of this general type but with the valve seats held in place by blocking plates extending into slots both in the valve body and valve seat.

According to the present invention there is provided a ball valve comprising a valve body formed from a tubular member with a cylindrical hole extending therethrough; a stem having one end thereof projecting into the hole; a generally spherical ball in the hole fixed to an end of the stem, the ball having a circular bore extending diametrically therethrough, a seat carrier in the hole, the seat carrier having one end adjacent the ball to maintain the ball in position; a connecting sleeve contacting the seat carrier at the other end thereof opposite the end adjacent the ball; and a union nut for coupling the connecting sleeve to the valve body; characterised by diametrically opposed projections extending into the hole on the inner surface of the valve body and formed integrally with the valve body, recesses formed on the external surface of the side of the seat carrier adjacent the one end thereof; diametrically opposed grooves extending in the circumferential direction from the adjacent recesses; wherein when the seat carrier is inserted into the valve body and rotated therein, the projections on the valve body engage the grooves in the seat carrier to thereby hold the seat carrier in the valve body, wherein the ball has removed chordal segments at opposite ends; and the length of each projection in the circumferential direction and the height of each projection in the radial direction are less than the length and height of the removed chordal segments of the ball so that on assembly the ball is inserted into the valve body through the hole past the projections and retained therein by the seat carrier.

The present invention makes it possible to fix the seat carrier to the valve body without hindering insertion of the ball, by providing projections on the inner wall surface of the valve body. In particular, while the ball has a generally spherical shape it is symmetrically cut-away on both sides of the bore or circular flow passage which extends diametrically therethrough so as to permit insertion. When the ball is viewed in the axial direction of the valve body at the time of being inserted in the valve body, the ball has cut-away portions comprising chordal segments on both

sides. The projections are formed on the inner surface of the valve body within the range of the chordal segments, and so can be used to fix the seat carrier to the valve body without hindering insertion of the ball. The projections are thus formed on the inner surface of the valve body, and the projections are restricted within the range of the chordal segments, each of which has a chord extending parallel to the stem axis and has a length approximately equal to the diameter of the bore in the ball. It may be defined more precisely that each of the chordal segments is, in the cross-section of the valve body, an arched area surrounded by the circle indicating the inner surface of the valve body and by a chord extending parallel to the stem axis and passing two points at which the circle indicating the contour of the ball intersects with two straight lines which are tangents of a circle having the diameter of the bore in the ball and perpendicular to the stem axis. Further, the seat carrier is partly cut-away on the outer surface thereof, and the cut-away portions are located at diametrically opposed positions, extended slightly in the axial direction of the seat carrier to form recesses and to form grooves extending in the circumferential direction. The seat carrier is inserted in the valve body, then while the projections of the valve body are positioned in the recesses of the seat carrier, the seat carrier is further advanced in the valve body, thereafter the seat carrier is rotated to fit or engage the projections in the grooves, and thus, the seat carrier is fixed to the valve body.

With the invention, since the projections are on the inner wall surface of the valve body at positions which are opposed to each other on a diameter perpendicular to the stem axis, the projections are within the cut-off, chordal segment portions of the ball formed by making the diametric bore in the ball. Thus, when the ball is to be inserted in the valve body the projections do not hinder insertion of the ball. Further, the projections are formed on the inner surface of the valve body which contacts the seat carrier, and the recesses and grooves are formed on the outer surface of the seat carrier and around opposite portions on a diameter of the seat carrier such that the recesses start from the forward end of the seat carrier and advance in the axial direction thereof, and the grooves are connected to each of the recesses and advance in the circumferential direction. Thus by mating the recesses with the projections, the seat carrier can be inserted into the valve body beyond the projections. Furthermore, the grooves are connected to the recesses and extend in the circumferential direction, and therefore, by rotating the seat carrier in the valve body, the seat carrier can be fixed in the valve body so that the seat carrier does not come out of the valve body. Thereafter, the connecting sleeve is applied to the end of the seat carrier, and it is coupled to the valve body by the union nut.

According to the invention, the projections are formed on one of the contacting surfaces of the valve body, while the recesses and grooves are

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formed on the opposed contacting surface, on the seat carrier. The recesses start from the inner end of the surface and advance along the surface in the axial direction, and the grooves are connected with the recesses and advance in the circumferential direction, by mating the projections with the recesses, the seat carrier can be inserted into the valve body beyond the projections, and then by rotating the seat carrier to advance the projections in the grooves, the seat carrier can be fixed in the valve body. Preferably the side surface of the projections or grooves is slightly inclined in a spiral form, so the seat carrier can be readily advanced deeply into the valve body as it is rotated. Moreover, when the groove width is made slightly larger than the projection width, the projections will have play in the grooves and the seat carrier can be slightly moved in the valve body in the axial direction thereof.

Figures 1-7 illustrate a first embodiment of the ball valve according to the first embodiment of the present invention.

Figure 1 is a vertical cross-sectional view of the ball valve.

Figure 2 is a horizontal cross-sectional view of the valve along II-II line in Figure 1.

Figure 3 is a side view of the valve body of the ball valve.

Figure 4 is a cross-sectional view of the valve body along IV-IV line in Figure 3.

Figure 5 is a side view of the valve body in Figures 3 and 4, with a stem and ball.

Figure 6 is a plan view of a seat carrier.

Figure 7 is a side view thereof.

In Figures 1-7, valve body 1 has a cylindrical hole extending therethrough, which forms a valve chamber. A stem 3 laterally extends into valve body 1 with one end projecting into the hole of the valve body 1. Stem 3 can be rotated in the valve body.

A spherical ball 2 has a circular bore extending diametrically therethrough, and is inserted in the hole of the valve body 1. Ball 2 is partly cut at the top thereof to form a groove 21, which extends in a direction perpendicular to the axis of the bore. Therefore, when ball 2 is inserted in the hole with the bore extending in a direction perpendicular to the axial direction of the valve body 1, groove 21 can receive the end of stem 3 and the ball 2 is secured to the stem 3. Thus, when the bore intersects perpendicularly with the hole, ball 2 can be engaged with or removed from the stem 3, and when ball 2 is engaged with stem 3, ball 2 is secured to stem 3 and can be rotated as desired.

Projections 12 are formed on the inner surface of valve body 1. In particular, projections 12 are formed on the surface which contacts the seat carrier 5 and are opposed to each other on a diameter perpendicular to the axis of stem 3. Projections 12 extend in the circumferential direction of valve body 1, and the extension in the circumferential direction and height in the radial direction should be within the range of the chordal segments formed by the diametrically cut-off portions of ball 2, when the ball 2 is viewed

perpendicularly to the axis of the bore. Further, the thickness of projections 12 should be appropriately determined from the view-point that projections 12 should have a strength which can hold seat carrier 5 in the valve body against the fluid pressure therein.

The chordal segments may be defined as, in cross-section of the valve body 1 shown in Figure 5, as an area surrounded by the circle (A) indicating the inner surface of the valve body 1 and by respective chords (B) extending parallel to the axis of stem 3 and passing two points (C) at which the circle (D) indicating the contour of ball 2 intersects with two straight lines (E) indicating the contour in the longitudinal direction of the bore in ball 2. The straight lines (E) may be viewed as lines which are tangents to the circle (F) having the diameter of the bore in ball 2 and perpendicular to the axis of stem 3.

Seat carrier 5 has a generally tubular form and is located on both sides of ball 2. Seat carrier 5 is provided with ball seat 4 at a portion facing to ball 2. For this purpose, seat carrier 5 is cut-away on the end surface facing the ball 2 to form an annular recess 51, which is formed by a cylindrical surface parallel to the inner surface of seat carrier 5 and by a flat surface perpendicular to the axis of seat carrier 5. Thus the cylindrical surface and the flat surface are an L-form in cross-section. Ball seat 4 is fitted in the annular recess 51, and a portion of the ball seat 4 closely contacts the ball 2. Ball seat 4 is usually made of a fluorine resin and integrally molded in an annular form. Ball seat 4 has an inner diameter substantially equal to that of the bore in ball 2.

Seat carrier 5 is inserted into valve body 1 with a small gap therebetween and is movable axially in valve body 1. However, the gap is very small and the cylindrical outer surface of seat carrier 5 is close to the inner surface of the valve body 1. Seat carrier 5 has a cylindrical hole extending therethrough in the longitudinal direction, the diameter of which is substantially equal to the diameter of the bore in ball 2. Seat carrier 5 is provided with ball seat 4 on the inner end facing ball 2 as noted above, and the opposite or outer end of the seat carrier 5 protrudes slightly from the end of the valve body 1. The opposite end surface is provided with an annular groove 59, and an O-ring 82 is positioned in the groove 59.

In order to fix seat carrier 5 within the valve body 1, i.e. for blocking, as shown in Figure 6, seat carrier 5 is provided with dogs 56 on the outer cylindrical surface thereof at an end portion close to ball 2. Dogs 56 are formed as seen in Figures 6 and 7, by partly cutting the outer portion of the end of seat carrier 5, which portion originally had a cylindrical surface close to the inner surface of the valve body 1, to form a pair of diametrical recesses and grooves connected with the recesses and extending in the circumferential direction of seat carrier. More particularly, the recesses 50 are provided in diametrically opposed positions. Grooves 55 are formed at the forward end of each of the recesses 50 and extend in the

circumferential direction. The recesses 50 can extend within a certain range in the circumferential direction. The range is greater than the extent of projections 12 formed on the valve body 1. Grooves 55 can also extend in the circumferential direction until the grooves are connected to each other to form an annular groove, however, the grooves are preferably not connected to each other. The width of grooves 55, that is in the axial direction of the seat carrier 5, should be slightly larger than the width of projections 12 in the axial direction of the valve body 1. As a result of the recesses 50, grooves 55, and dogs 56 are formed in the outer surface of seat carrier 5 such that the outer surface of seat carrier 5 comprises a small diameter portion 53 consisting of the recesses 50 and grooves 55, and a large diameter portion 52 consisting of the remainder, including dogs 56. Further, another annular groove 58 is formed on the large diameter portion 52 and is separated from the grooves 55. O-ring 81 is fitted into groove 58.

After ball 2 has been fixed to stem 3, seat carrier 5 is inserted in the valve body 1 with ball seat 4 facing the ball 2. When seat carrier 5 is inserted in valve body 1, it is maintained so that the recesses 50 on seat carrier 5 are aligned with projections 12 in the valve body 1, such that seat carrier 5 can advance deeply into the valve body such that dogs 56 move inwardly beyond projections 12 until ball seat 4 contacts ball 2. Thereafter seat carrier 5 is rotated to advance projections 12 in grooves 55, and as a result, dogs 56 are held by the projections 12, so that seat carrier 5 cannot be pulled out of the valve body 1. When the width of the projections 12 is less than the width of grooves 55, the projections 12 can be biased in grooves 55 to provide play, and thereby seat carrier 5 can be advantageously advanced to compensate for a gap caused by abrasion of ball seat 4.

Seat carrier 5 is thus fixed in valve body 1, positioned on both sides of ball 2, with ball seat 4 closely contacting ball 2, while allowing ball 2 to rotate freely around the center thereof. Further, seat carrier 5 has annular groove 58 on the outer surface thereof, and the groove 58 receives O-ring 81, which prevents the fluid from leaking between seat carrier 5 and valve body 1.

The outer end surface of seat carrier 5 extends slightly beyond the end surface of valve body 1. Connecting sleeve 6 contacts the extended end surface of seat carrier 5. In order to prevent leakage of the fluid, the extended end surface is provided with annular groove 59 for receiving O-ring 82. Connecting sleeve 6 has a flange on the end thereof which contacts seat carrier 5. Union nut 7 covers the flange and joins the connecting sleeve 6 to the end of valve body 1 by means of thread 11 provided on the outer surface at the end of the valve body 1. Since the seat carrier 5 is fixed in valve body 1 with the outer end surface extending from the end surface of valve body 1, projections 12 can be biased toward ball 2 in grooves 55 so as to have an outward play, and

seat carrier 5 can be advanced inwardly towards ball 2 without difficulty by further tightening union nut 7. As a result, seat carrier 5 and seat 4 are always maintained in close contact with ball 2.

According to the present invention, the ball valve illustrated in Figures 1-7, can be readily assembled and disassembled, notwithstanding projections 12 formed on the inner surface of the valve body. On assembling, stem 3 is first turned to a position to shut the valve chamber in valve body 1, then ball 2 is inserted in the valve chamber with the bore 22 turned sideways, and ball 2 is advanced inwardly beyond projections 12 to just below stem 3. Since ball 2 has chordal segments cut-away on both sides thereof due to circular bore 22 which extends diametrically therethrough, the projections 12 formed on the inner surface of the valve body are within the chordal segments of ball 2. Thus, ball 2 can be connected with stem 3 in the same manner as in conventional ball valves.

Thereafter, seat carrier 5 is inserted in valve body 1 by aligning the recesses of the seat carrier with projections 12 of the valve body 1, and seat carrier 5 is then rotated in valve body 1 to move projections 12 into grooves 55, such that seat carrier 5 is fixed in valve body 1. Connecting sleeve 6 is then attached to the outer end surface of seat carrier 5 with the flange of connecting sleeve 6 abutting against the end surface of ball carrier 5. The flange is covered with union nut 7, which is then engaged with valve body 1, and thereby connecting sleeve 6 is joined to valve body 1. Further, leakage can be prevented by further tightening union nut 7 to advance ball carrier 5 inwardly.

The ball valve is thus assembled and the assembled valve can be disassembled without difficulty by conducting the above steps in the reverse order. On disassembling, the ball 2 is first turned to closed position, then union nut 7 is removed from valve body 1. Seat carrier 5 does not come out, but remains fixed in the valve body 1, and therefore, the connecting sleeve can be removed or replaced, which permits other connected pipes to be repaired or replaced without cutting off upstream pressure and fluid. Even if union nut 7 is taken off and connecting sleeve 6 is removed while the fluid pressure is being applied in the valve, seat carrier 5 still remains fixed in the valve body 1. When the fluid pressure is not applied in the valve, seat carrier 5 can be readily taken out by rotating it and moving dogs 56 out of engagement with projections 12. After seat carrier 5 has thus been removed, ball 2 can be readily taken out from valve body 1, and thus the ball valve can be disassembled without difficulty.

The above valve can be made of a metal or a hard synthetic resin. Among the synthetic resins, a thermoplastic synthetic resin, especially a hard vinyl chloride resin is preferable. When a thermoplastic synthetic resin is used, it is preferable to use an injection molding process for preparing the valve. The O-ring, however, is preferably made of a resilient material such as natural or

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synthetic rubber. The ball valve according to the first embodiment of the present invention is superior to a conventional ball valve in that the ball valve is manufactured with ease and will not give rise to leakage of fluid. For example, the ball valve according to the disclosures in United States Patent No. 4,059,250, requires a complicated mold for manufacturing, because the valve body must be provided with recesses and grooves in the vicinity of both ends, and accordingly, the mold for manufacturing the valve body must be provided with mold cores having special portions, the outer diameters of which are reduced when the mold core is to be removed. In contrast, the ball valve according to the present invention can be manufactured by means of a simple mold, because the valve body is provided with only partial projections at inner portions thereof, and accordingly, it is sufficient if only the mold core is provided with a central portion, the outer diameter of which can be reduced when removed. As a result, molding operations of the present invention becomes simple compared with those in the above prior art U.S. patent. Further, the mold portion, the outer diameter of which must be reduced when the mold is to be removed from a molded article, is generally liable to produce fins in a groove. The fins extend in the width direction of the groove and stand on the inner surface of the groove, because in order to form the groove it is necessary for the mold portion to have abutting lines extending in the width direction of the groove. The groove is thus liable to give rise to fluid leakage, especially, when the groove is positioned in the vicinity of the ends. In the prior art, the fins in the groove were removed by a subsequent cutting operation, and the manufacturing operations were difficult. In contrast, according to the present invention, the valve body does not contain any grooves and is liable to produce fins only in the central portions located between the projections in the valve body, and accordingly, a good valve can be readily obtained which will not produce the fluid leakage and which does not require a subsequent cutting operation.

According to the present invention, a ball valve comprises a tubular valve body with a cylindrical hole extending therethrough, a stem with an end thereof projecting into the hole, and a ball having a circular bore diametrically extending therethrough and inserted in the hole and fixed rotatably to the end of the stem. A seat carrier is inserted in the hole and situated to the side of the ball, a connecting sleeve contacts the seat carrier, and a union nut joins the connecting sleeve to the valve body. The valve body is provided with the projections on the inner surface thereof opposed to each other on a diameter perpendicular to the stem axis. The projections do not hinder the ball passing through the hole in the valve body either when the ball is to be inserted or when to be removed. The seat carrier is partly cut on the outer surface around diametrically opposite portions on one end thereof to form recesses, each of

which starts from the end and advances in the axial direction of the seat carrier. The seat carrier can be inserted without difficulty in the hole of the valve body by advancing the seat carrier with the recesses thereof are aligned with the projections of the valve body. Further, on the outer surface of the seat carrier, grooves are formed at the forward end of each of the recesses which extend in the circumferential direction, and therefore, the seat carrier can be fixed in the valve body by rotating the seat carrier in the circumferential direction to bring the projections of the valve body into the grooves of the seat carrier. As a result, the seat carrier does not come out of the valve body if the union nut is removed without stopping the fluid under pressure in the valve, and the connecting sleeve can be removed to repair a connected pipe. Furthermore, since the valve body is not provided with any recessed portion such as a groove, but simply provided with the projections on the inner surface thereof, the valve body is not decreased in pressure resistance or strength, and therefore, has a sufficient pressure resistance without increasing the thickness and weight of the valve body. Furthermore, when the valve body is made of a synthetic resin with injection molding, the mold for preparing the valve body can be simplified and the valve body can be manufactured with ease and at moderate prices. The present invention brings about these advantages.

Claims

1. A ball valve comprising a valve body (1) formed from a tubular member with a cylindrical hole extending therethrough; a stem (3) having one end thereof projecting into the hole; a generally spherical ball (2) in the hole fixed to an end of the stem, the ball having a circular bore (22) extending diametrically therethrough, a seat carrier (5) in the hole, the seat carrier having one end adjacent the ball to maintain the ball in position; a connecting sleeve (6) contacting the seat carrier at the other end thereof opposite the end adjacent the ball; and a union nut (7) for coupling the connecting sleeve to the valve body; characterised by diametrically opposed projections (12) extending into the hole on the inner surface of the valve body and formed integrally with the valve body, recesses (50) formed on the external surface of the side of the seat carrier adjacent the one end thereof; diametrically opposed grooves (55) extending in the circumferential direction from the adjacent recesses; wherein when the seat carrier is inserted into the valve body and rotated therein, the projections (12) on the valve body engage the grooves (55) in the seat carrier to thereby hold the seat carrier in the valve body, wherein the ball has removed chordal segments at opposite ends; and the length of each projection (12) in the circumferential direction and the height of each projection in the radial direction are less than the length and height of the removed chordal segments of

the ball so that on assembly the ball is inserted into the valve body through the hole past the projections and retained therein by the seat carrier.

2. A ball valve according to claim 1, wherein the width of each groove (55) is larger than the width of each projection (12), and the projection is biased in the groove towards the ball.

3. A ball valve according to claim 1 or 2, wherein the other end of the seat carrier (6) extends out from the end surface of the valve body.

4. A ball valve according to claim 1, 2 or 3 wherein each of the grooves includes stopper means (56) for engaging the projections and for limiting the rotation of the seat carrier with respect to the valve body.

5. A ball valve according to claim 1, 2, 3 or 4 including an annular ball seat (4) and, wherein the seat carrier (5) includes an annular recess (51) formed in the one end thereof, the annular ball seat being positioned in the annular recess.

6. A ball valve according to any preceding claim wherein the valve body is made of a hard thermoplastic resin.

7. A ball valve according to any preceding claim wherein the side surface of at least one of the grooves or projections is inclined in a spiral form, such that the seat carrier is advanced progressively inwardly in the valve body as it is rotated.

Patentansprüche

1. Kugelventil mit einem Ventilkörper (1), der von einem rohrförmigen Element mit einem zylindrischen Loch gebildet ist, das sich durch das Element hindurch erstreckt, mit einem Stößel (3), von dem ein Ende in das Loch vorsteht, mit einer im allgemeinen kugelförmigen Kugel (2) im Loch, die an einem Ende des Stößels befestigt ist, wobei die Kugel eine kreisförmige Bohrung (22) aufweist, die sich diametral durch die Kugel hindurch erstreckt, mit einem Sitzträger (5) im Loch, wobei der Sitzträger ein Ende aufweist, das an der Kugel anliegt, um die Kugel in Position zu halten, mit einer Anschluhlse (6), welche den Sitzträger an dessen anderem, zu dem an der Kugel anliegenden Ende entgegengesetzten Ende berhrt, und mit einer Verbindungsmutter (7) zum Ankuppeln der Anschluhlse an den Ventilkrper, gekennzeichnet durch diametral gegenberliegende Vorsprnge (12), die sich an der Innenflche des Ventilkrpers in das Loch erstrecken und die mit dem Ventilkrper einteilig ausgebildet sind, durch an der Auenflche der zu dem einen Ende des Sitztrgers benachbarten Seite des Sitztrgers ausgebildete Ausnehmungen (50), durch diametral gegenberliegende Rillen (55), die sich von den benachbarten Ausnehmungen in Umfangsrichtung erstrecken, wobei die Vorsprnge (12) am Ventilkrper an den Rillen (55) im Sitztrger angreifen, wenn der Sitztrger in den Ventilkrper eingesetzt und darin gedreht wird, so da der Sitztrger im Ventilkrper gehalten wird,

wobei die Kugel an entgegengesetzten Enden entfernte Sehnensigmente aufweist, und die Lnge jedes Vorsprungs (12) in der Umfangsrichtung und die Hhe jedes Vorsprungs in der radialen Richtung kleiner sind als die Lnge und die Hhe der entfernten Sehnensigmente der Kugel, so da die Kugel an der Struktur in den Ventilkrper durch das Loch nach den Vorsprngen eingesetzt und darin durch den Sitztrger festgehalten wird.

2. Kugelventil nach Anspruch 1, dadurch gekennzeichnet, da die Breite jeder Rille (55) grer ist als die Breite jedes Vorsprungs (12), und da der Vorsprung in der Rille zur Kugel hin vorgespannt ist.

3. Kugelventil nach Anspruch 1 oder 2, dadurch gekennzeichnet, da das andere Ende des Sitztrgers (6) aus der Endflche des Ventilkrpers heraus vorsteht.

4. Kugelventil nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, da jede Rille eine Anschlageinrichtung (56) zum Angreifen an den Vorsprngen und zur Begrenzung der Rotation des Sitztrgers relativ zum Ventilkrper enthlt.

5. Kugelventil nach Anspruch 1, 2, 3 oder 4 mit einem ringfrmigen Kugelsitz (4), dadurch gekennzeichnet, da der Sitztrger (5) eine ringfrmige Ausnehmung (51) enthlt, die am einen Ende desselben ausgebildet ist, wobei der ringfrmige Kugelsitz in der ringfrmigen Ausnehmung angeordnet ist.

6. Kugelventil nach einem der vorhergehenden Ansprche, dadurch gekennzeichnet, da der Ventilkrper aus einem thermoplastischen Harz besteht.

7. Kugelventil nach einem der vorhergehenden Ansprche, dadurch gekennzeichnet, da die Seitenflche von mindestens einer der Rillen oder Vorsprnge spiralfrmig geneigt ist, so da der Sitztrger progressiv in den Ventilkrper hinein verschoben wird, wenn er gedreht wird.

Revendications

1. Robinet à boisseau sphrique comprenant un corps de robinet (1) form d'un organe tubulaire comportant un trou cylindrique s'tendant à travers lui; une tige (3) dont une extrmit s'tend dans le trou; un boisseau (2) gnralement sphrique dispos dans le trou et fix à une extrmit de la tige, le boisseau ayant un alsage circulaire (22) s'tendant diamtralement à son travers; un support de sige (5) dans le trou, le support de sige ayant une premire de ses extrmits adjacente au boisseau pour maintenir le boisseau en position; un manchon de raccordement en contact avec le support de sige à son autre extrmit oppose à l'extrmit adjacente au boisseau; et un crou de liaison (7) pour accoupler le manchon de liaison au corps de robinet; caractris par des saillies (12) diamtralement opposes s'tendant dans le trou à la surface interne du corps de robinet et formes d'une seule pice avec le corps de robinet, des renforcements (50) forms à la surface externe

du côté du support de siège adjacent à sa première extrémité; des rainures (55) diamétralement opposées s'étendant dans la direction circonférentielle à partir des renforcements adjacents; de telle sorte que lorsque le support de siège est inséré et tourné dans le corps de robinet, les saillies (12) sur le corps de robinet s'engagent dans les rainures (55) du support de siège pour maintenir le support de siège dans le corps de robinet, le boisseau ayant des segments de corde enlevés à ses extrémités opposés; et la longueur de chaque saillie (12) dans la direction circonférentielle et la hauteur de chaque saillie dans la direction radiale sont inférieures à la longueur et à la hauteur des segments de corde enlevés du boisseau de sorte que lors de l'assemblage le boisseau est inséré dans le corps de robinet à travers le trou au-delà des saillies, et retenu à l'intérieur par le support de siège.

2. Robinet à boisseau sphérique selon la revendication 1, dans lequel la largeur de chaque rainure (55) est supérieure à la largeur de chaque saillie (12), et la saillie est forcée dans la rainure vers le boisseau.

3. Robinet à boisseau sphérique selon la revendication 1 ou 2, dans lequel l'autre extrémité du

support de siège (6) s'étend à l'extérieur à partir d'une surface d'extrémité du corps de robinet.

4. Robinet à boisseau sphérique selon la revendication 1, 2 ou 3, dans lequel chacune des rainures comprend des moyens de butée (56) pour venir en contact avec les saillies et pour limiter la rotation du support de siège par rapport au corps de robinet.

5. Robinet à boisseau sphérique selon la revendication 1, 2, 3 ou 4, comprenant un siège annulaire (4) de boisseau et dans lequel le support de siège (5) comprend un renforcement annulaire (51) formé à une de ses extrémités, le siège annulaire de boisseau étant disposé dans le renforcement annulaire.

6. Robinet à boisseau sphérique selon l'une quelconque des revendications précédentes, dans lequel le corps de robinet est réalisé en résine thermoplastique dure.

7. Robinet à boisseau sphérique selon l'une quelconque des revendications précédentes, dans lequel la surface latérale d'au moins une des rainures ou des saillies est inclinée en forme de spirale, de telle sorte que le support de siège est avancé progressivement à l'intérieur du corps de robinet lorsqu'il est tourné.

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FIG. 1

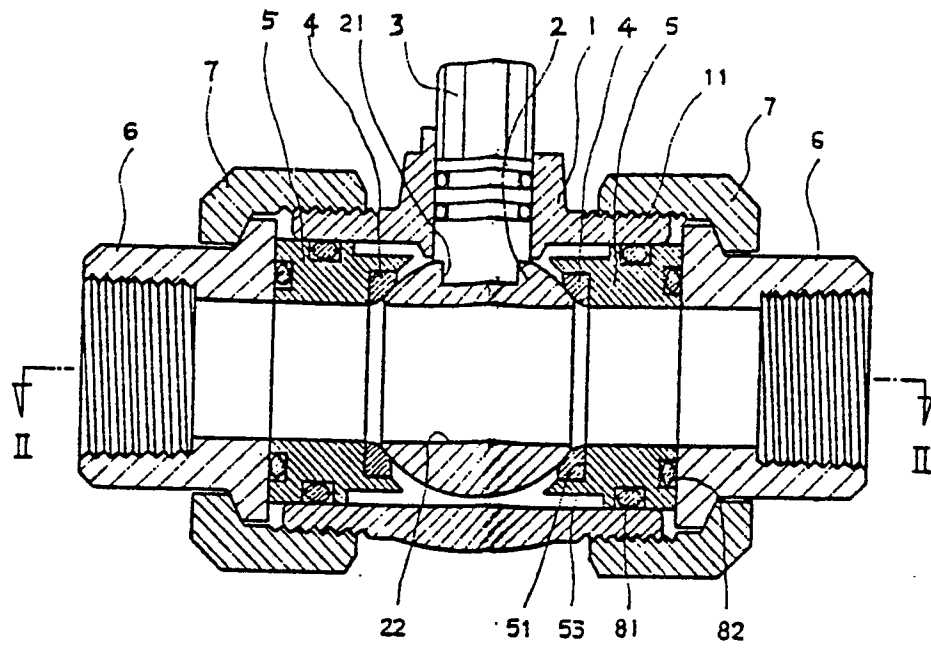


FIG. 2

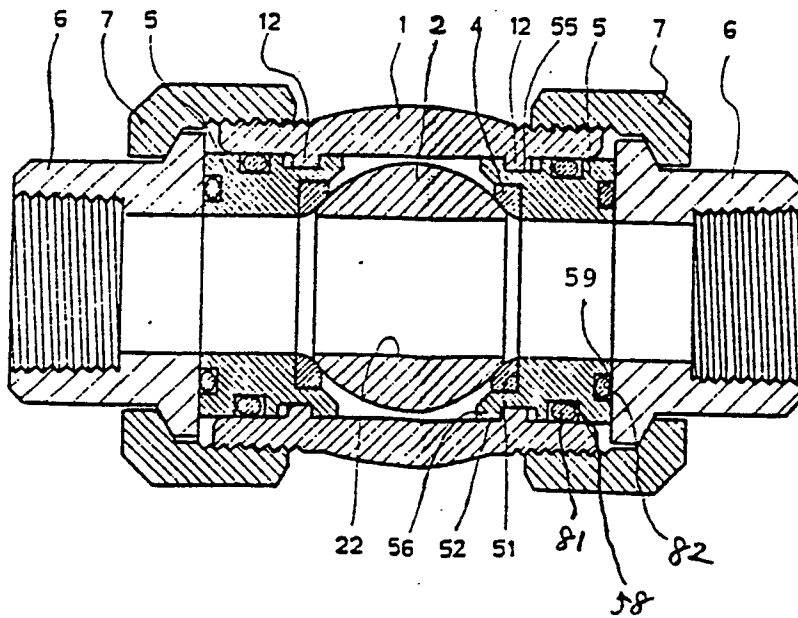


FIG. 3

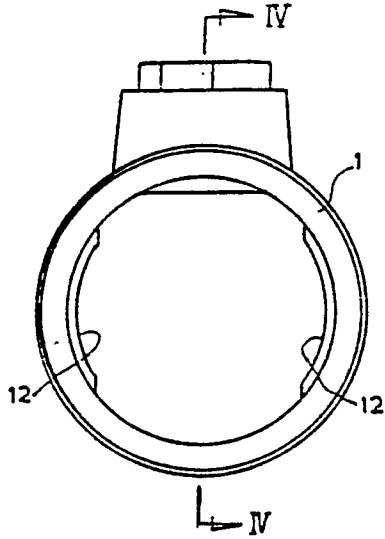


FIG. 4

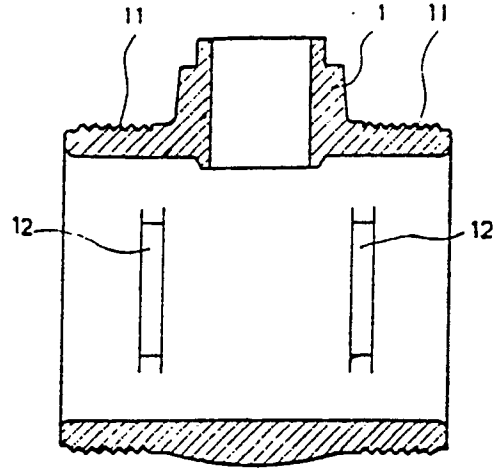


FIG. 5

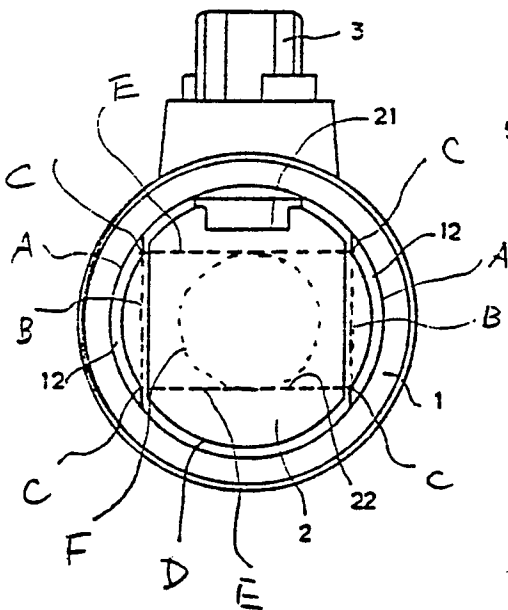


FIG. 7

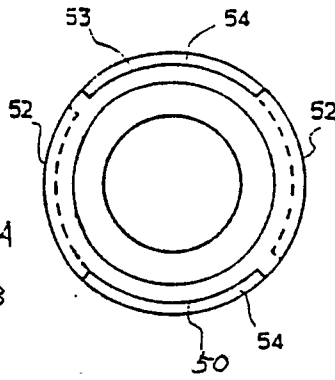


FIG. 6

